taneously occupied by a transpiration current; parts of it may be so occupied, while parts of it are filled with air, and do not function as water-ways. This is a valuable contribution to knowledge, and to the adherents of the new theory it is priceless; the very existence of their hypothesis may depend on it.

Strasburger's statements and reasoning are by no means accepted by every one; for instance, Schwendener refuses to take them seriously (*K. Preuss. Akad.*, 1892, p. 931).

Strasburger has microscopically examined the condition of the tracheals as regards air.[1] He found in the spruce fir in July "almost no air bubbles" in the wood of the current year, but air in considerable quantity in four-year-old wood. In the same month *Pinus Salzmanni* (*Laricio*) showed scattered bubbles in the spring wood of last year, and more in the autumn wood. In a larch there were only very occasional bubbles in the two last years' wood. In the silver fir the current year's wood was practically free from air: the air increased in the inner rings. *Tsuga canadensis* had no air in this year's wood, only a little in last year's, and an increasing quantity in the older rings, the fifth being very rich in air. In February, *Pinus strobus* had hardly any air in this year's wood, and the silver fir was all but free from it in the youngest ring. Robinia in July had the youngest wood almost air-free. *Ficus elastica* and *spuria*, various *Acacias*, and willows gave vessels not entirely free from air, but nearly so. He concludes (*loc. cit.* p. 688) that the path of the transpiration current is not absolutely free from air. The younger wood, which especially functions as the water-carrier, is the most free.

Dixon and Joly quote Strasburger's results, which they consider sufficiently favourable to their views. They rely, in addition, on the impermeability of wet cell-walls to air, isolating the conduits in which air has appeared; and on the possibility that the air may be redissolved under root-pressure (*Phil. Trans.* p. 572), an idea well worth testing.

I think Strasburger's facts are not so favourable to their theory as these authors believe; in the same way it seems to me that Askenasy is rash in saying[2] that the tracheals in many cases contain continuous columns of water. It is true that this statement does not affect the validity of his general argument, since he faces the undoubted occurrence of air bubbles in many cases. This is undoubtedly necessary, and, fortunately, we can once more turn to the *Leitungsbahnen*. Strasburger states that he has seen water creep past the air bubbles (*Leitungsbahnen*, pp. 704, 709; see also "Hist. Beitr." v. p. 76) in coniferous tracheids. The best evidence for this seems to be the fact mentioned (*ibid.* p. 79), that the part of a single tracheid in front of an air bubble gets red with absorbed eosin, though the neighbouring tracheids are colourless. This clearly suggests the creeping round the bubble which Strasburger believes in. Schwendener (*Zur. Kritik*, &c., p. 921) has been unable to confirm Strasburger's microscopic observations, and, moreover, denies the physical possibility of the phenomena. I am unable to judge of the validity of Schwendener's theoretic objections, and must leave this point. It is a question of great importance whether it is possible that, on the breaking of a column of water, a film of water remains surrounding the air bubble, and capable of holding the two columns together. If this is impossible, we must suspend our judgment until we know more of the contents of the tracheals.

To sum up this part of the subject, we may believe that the tracheals in their youngest condition may contain water in continuous columns, since the cambium cells from which they arise certainly contain fluid. But we know also that this condition is not absolutely maintained, since Strasburger has shown that the young wood contains air, though in small quantity. We must, therefore, believe either (1) that the transpiration current is able to travel past the air bubbles, or (2) that tracheals partly filled with air may again become continuous water-ways by solution of the air. If we adopt the first alternative, we must believe that the film of water between the bubble and the wall of the vessel is able to bear such a tensile stress that it can serve to link the column above with the column below the bubble. But this is analogous to trusting a rope so nearly cut through that only a few threads remain intact. With regard to the second alternative, we have, at least, indications from Strasburger's work that a tracheal partly filled with air does not necessarily remain permanently functionless (see *Leitungsbahnen*, p. 692).

The isolation of the tracheals.—There are a number of points connected with the structure and properties of wood which ought to be considered in relation to the modern theories. Want of space forbids my doing more than referring to two of them.

The resistance which the wetted cell-wall offers to the passage of undissolved air is a point on which many writers have laid stress. It is clear that on any theory of the movement of water in the tracheals, it is essential that air should not filter into the water-way. This necessity is not, however, stronger in the case of the modern theories we are considering. The pressure tending to fill the tracheals with air from outside cannot be greater than atmospheric pressure, and since the wetted cell-walls of gymnospermous wood can resist the passage of air under a pressure of about an atmosphere,[1] we need not fear criticism of the theory on this ground. The above remarks seem, however, to be needed in face of the frequently recurring statement that wet wood membranes are impermeable to free air. Schwendener has some good remarks on this head (*Zur Kritik*, p. 943).

Strasburger has called attention to the important subject of the localisation or isolation of vessels, or of certain lines of tracheids. When this is possible we may have one set of tracheals containing continuous water columns, while neighbouring ones contain air at negative pressure (see *Histolog. Beiträge*, v. p. 87). This is especially important in connection with the Dixon-Joly-Askenasy theory, since, if there were no such isolation, a functioning tracheal containing a continuous column of water would give up its water to one which was not functioning. In other words, the inactive tracheals would, by negative pressure, suck water from the active ones. In the coniferous trees, the young wood is cut off by the absence of pits in the tangential walls[2] from free communication with the older wood, where air is more frequent.

In the same way the valve-like closure of the pits by the aspiration of the pit membrane, comes to be a subject of much importance.

At present I merely wish to show by a couple of examples the necessity of a complete study of the minute structure of wood in relation to the modern theories. It is, at least, a hopeful fact for Messrs. Dixon, Joly, and Askenasy that we cannot point to anything in the anatomy of wood which is absolutely inconsistent with their views. Finally, with regard to the question at large, whether we are friends or opponents of Messrs. Dixon, Joly, and Askenasy's theory, the broad facts remain that water has the power of resisting tensile strength, and that this fact must henceforth be a factor in the problem. There are difficulties in the way of our author's theory, but it is especially deserving of notice that many of these difficulties are equally serious in the case of any theory which excludes the help of the living elements of the wood, and assumes a flow of water in the tracheals. The authors have not only suggested a *vera causa*, but have done so without multiplying difficulties. There is, therefore, a distinct balance in their favour.

Huxley, quoting from Goethe, makes use of the expression *thätige Skepsis*. It is a frame of mind highly appropriate to us in the present juncture, if we interpret it to mean a state of doubt whose fruit is activity, and if we translate activity by experiment.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

Mrs. Randall, of Massachusetts, has bequeathed to Radcliff College (the Harvard annex for women) 20,000 dollars; an equal amount to the Prospect Union, and 70,000 dollars to the Foxcroft Club of Harvard.

The Council of University College, Liverpool, on the recommendation of the Senate and Medical Faculty, have converted the Medical Lectureship of Hygiene into a Professorship of Public Health, and have appointed Dr. E. W. Hope, Medical Officer of Health to the Corporation of Liverpool, to the chair.

---

[1] *Leitungsbahnen*, p. 683 *et. seq.*; Russow in 1882 (*Bot. Centr.*) vol. xiii. 1883) observed similar facts in the distribution of water and air.

[2] *Verhand. Naturhist. med. Vereins Heidelberg*, 1895, p. 15.

[1] *Leitungsbahnen*, p. 722. Nägeli and Schwendener, *Das Mikroskop*, 2nd edit. p. 367, give 225 cm. of mercury.

[2] Strasburger discusses, in this connection, the existence of tangential pits in the autumnal wood (see *Leitungsbahnen*, p. 713).

© 1897 Nature Publishing Group

THE London Polytechnic Council, a joint committee comprising representatives of the Council of the City and Guilds of London Institute, the Technical Education Board of the London County Council, and the central governing body of the City Parochial Foundation, adopted the following resolution at a specially convened meeting on Friday last:—"The London Polytechnic Council having had under their consideration the London University Commission Bill, and being satisfied that the students of London polytechnic institutes pursuing a course of study approved by the University under one or more of the recognised teachers of the University will enjoy equal facilities with students of a school of the University in graduating at the University, expresses its approval of the Bill and its hope that the Bill may be passed during the present Session, as affording a satisfactory solution of the London University question."

THE following are among recent appointments:—W. W. Watts, assistant geologist on the Geological Survey of the United Kingdom, to be assistant professor in Geology at the Mason College, Birmingham; Prof. R. C. Woodward to be president of the University of South Carolina; Dr. C. E. Beecher to be University professor of historical geology at Yale University; Dr. L. V. Pirsson to be professor of physical geology in the Lawrence Scientific School; Dr. F. E. Hull to be professor of physics in Colby University; Prof. William A. Rogers to be professor of physics in Alfred University at Alfred, N.Y.; Dr. Jaeger and Dr. Brodhun to be professors at the Reichsanstalt at Charlottenburg; Dr. Ignaz Zakezewski to be full professor of experimental physics at the University at Lemburg; Dr. H. Finger to be assistant professor of organic chemistry at the Polytechnic Institute in Darmstadt; Dr. A. L. Foley to be professor of physics in the University of Indiana; Dr. R. J. Aley to be professor of mathematics, and Mr. E. B. Copeland to be assistant professor of botany in the same University; Mr. T. I. Pocock to be assistant geologist on the Geological Survey of the United Kingdom; Dr. W. F. Hume and L. Gorringe to be assistants on the Geological Survey of Egypt.

THE London University Commission Bill passed through the House of Lords on Tuesday. The Duke of Devonshire, in moving the second reading on Friday last, said the Bill was substantially the same as the one which passed through the House with little discussion last Session, but for which, unfortunately, time did not allow full consideration in the other House. Certain modifications had been introduced which were the result of communications which had been in progress during almost the whole of the Session between those interested, and there was reason to hope that the difficulties which prevented the Bill from passing into law had been removed, and that it would pass now as practically an unopposed measure. He was sorry to say very considerable time had elapsed since Lord Cowper's Commission reported, and during that time a very great change had taken place in the higher education of the City of London, and this had caused the necessity for certain alterations of procedure in the Bill. Almost the only point discussed in the House last year was that which affected, or was supposed to affect, denominational colleges and principally King's College. The agreement which was arrived at last year had been embodied in somewhat different terms in the present Bill, and he believed it was now practically accepted by King's College and the principal bodies concerned, and was now not objected to by Lord Herschell, who took a strong line of opposition last year. The Earl of Kimberley said as he was a member of the Senate of the University he was aware of the circumstances to which the noble Duke had alluded, and which led to the introduction of this amended Bill. He did not think it was necessary or desirable to go into the provisions now; he would confine himself to saying the present form was the result of very careful consideration, he might say a compromise between the different interests. There was very sanguine hope, and he sincerely trusted it would be fulfilled, that the Bill in its present form was probably in the only form that would be acceptable to all parties concerned, and he hoped it might pass. The text of the Bill is printed in the *Times* of Saturday, July 24, from which we learn that the gentlemen who are to fill the statutory commission under the Bill are—Baron Davey, the Bishop of London, Lord Lister, Sir William Roberts, Sir Owen Roberts, Prof. Jebb, and Mr. E. H. Busk, the Chairman of Convocation of London University.

SCIENTIFIC SERIALS.

Wiedemann's Annalen der Physik und Chemie, No. 5.—Polarisation capacities, by C. M. Gordon. These were determined by a new arrangement of Wheatstone's bridge, in which a known capacity and resistance are introduced into one branch, and an electrolytic cell of unknown capacity and resistance in the other. A minimum is obtained in the telephone when the capacities are inversely as the resistances in the remaining branches. The author found that for small currents the polarisation is a reversible process, and that the counter E.M.F. is rigidly given by Kohlrausch's equation $E = \frac{1}{c}\int idt$. The best results were obtained with electrodes of "platinised" platinum.—Effect of concussion and heat upon magnetism, by Carl Fromme. Concussion exerts a well-defined effect upon magnetisation, which is independent of that produced by deformation, and of the magnetic history of the material. It acts directly upon the molecular magnets, probably by producing groupings of them, which reduce the magnetic moment and lower the susceptibility. The effects of concussion may be imitated by sending an alternating current through the magnetising coil and gradually reducing it to zero. Also, in the case of iron wires, by making them vibrate transversely.—Röntgen rays by A. Voller and B. Walter. As exhaustion is increased, less heat is developed in a discharge tube. The production of heat gives way before the production of Röntgen rays. The vacuum may be regulated by heating a small quantity of caustic potash in a side tube. The heating is best done by a small coil of wire carrying a current, wound on the outside of the side tube. The refractive index of diamond for X-rays does not differ from unity by more than 0·0002. This gives a limiting value for the wave-length of these rays. It is 1 $\mu\mu$, or the 600th part of that of the D line, assuming, of course, that the waves are transverse.—Co-efficient of thermal expansion of the white marble of Carrara, by I. Fröhlich. This is important, in view of its frequent use for inductance standards. Between 15° and 100° the mean coefficient of linear expansion is 0·000012.—Change of length of wooden rods with moisture and heat, by H. Stadthagen. Deal rods cut along the fibre were impregnated with linseed oil and painted with shellac varnish. The impregnation was carried out under a pressure of 1½ atmospheres and a temperature of 65°. It was found that the process does not make the rods independent of moisture, since the smaller pores remain accessible to it. The coefficient of expansion for 1 per cent. of relative humidity is 0·00001. The American method of compression at 200° under 14 atmospheres would probably yield better results.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, July 19.—M. A. Chatin in the chair.—The election of M. Virchow as Foreign Associate, in the place of the late M. Tchebichef, was approved by the President of the Republic.—Establishment of a uniform state in a pipe of large rectangular section, by M. J. Boussinesq.—Researches on the state in which elements other than carbon are found in cast iron or steel, by MM. Ad. Carnot and Goutal. The attack of the metal by appropriate solvents shows that silicon is present chiefly as the silicide FeSi. If manganese is present, however, the silicon combines with it in preference to iron. Sulphur behaves similarly, all the manganese apparently being turned into sulphide before any iron sulphide is formed. Phosphorus and arsenic show remarkable differences in their behaviour towards the solvent employed (a solution of potassium-copper chloride), the phosphorus being combined with the iron forming Fe_3P, while the arsenic is uncombined and simply dissolved in the casting.—Note relating to a memoir by M. D. Eginitis on the climate of Athens, by M. Lœwy.—Ephemeris of the periodic comet of D'Arrest, by M. G. Leveau.—On the quadratic integrals of dynamics, by M. P. Painlevé.—On the integration of systems of partial differential equations of the first order of several unknown functions, by M. Jules Beudon.—On surfaces referred to their lines of zero length, by M. Eugène Cosserat.—On a practical method of setting out gear teeth, by M. L. Lecornu.—On the phenomenon of the electric arc, by M. A. Blondel. In the experiments described, the passage of the current across the carbon poles was only broken

© 1897 Nature Publishing Group